

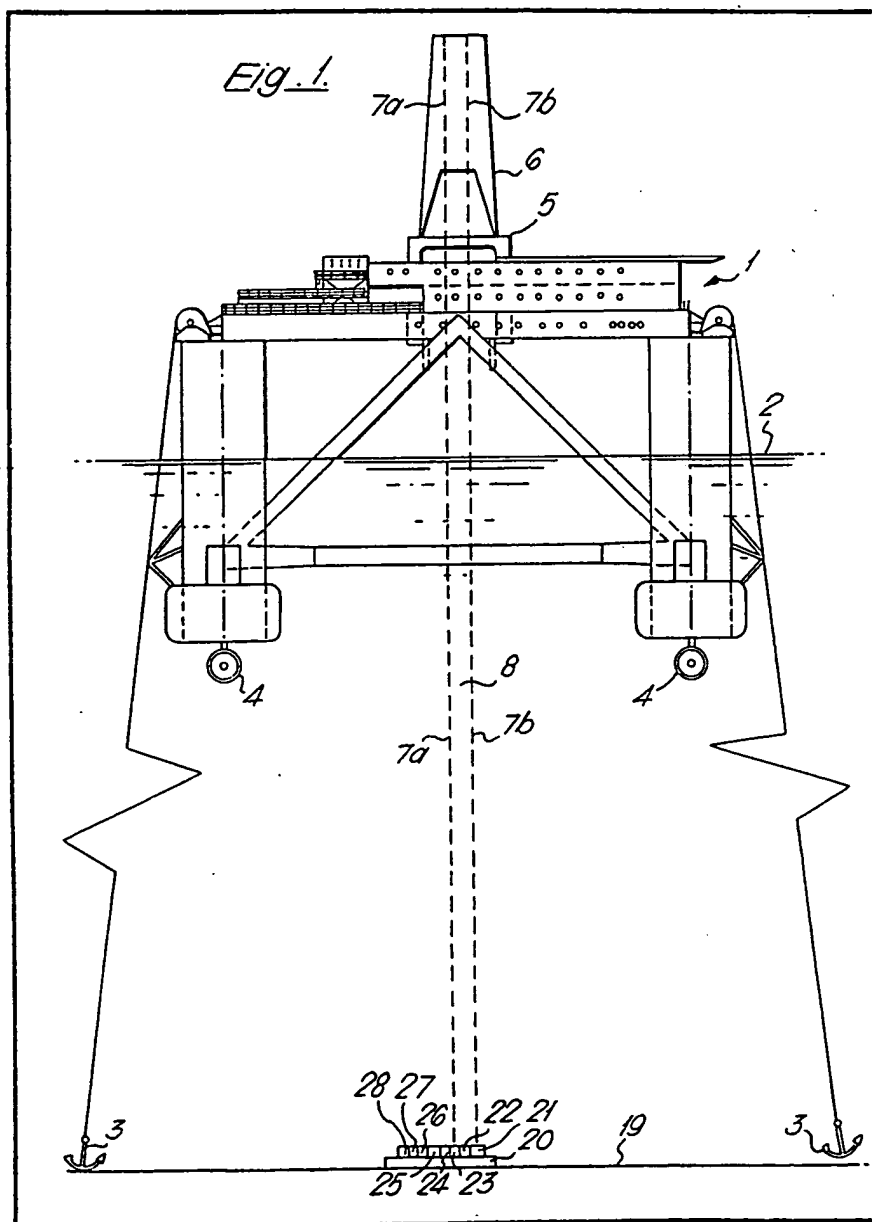
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(54) Drilling Vessels

(57) A vessel (1) for drilling hydrocarbon wells in the sea floor, such as a drill ship or a semi-submersible platform, is provided with a drilling tower (6) which is dimensioned and constructed to

receive at least two drill strings (7a, 7b). Preferably, the mutual spacing between the drill strings is substantially equal to an integral multiple of the desired spacing between neighbouring wells and is at least equal to the spacing required to enable the drill strings to be operated concurrently.



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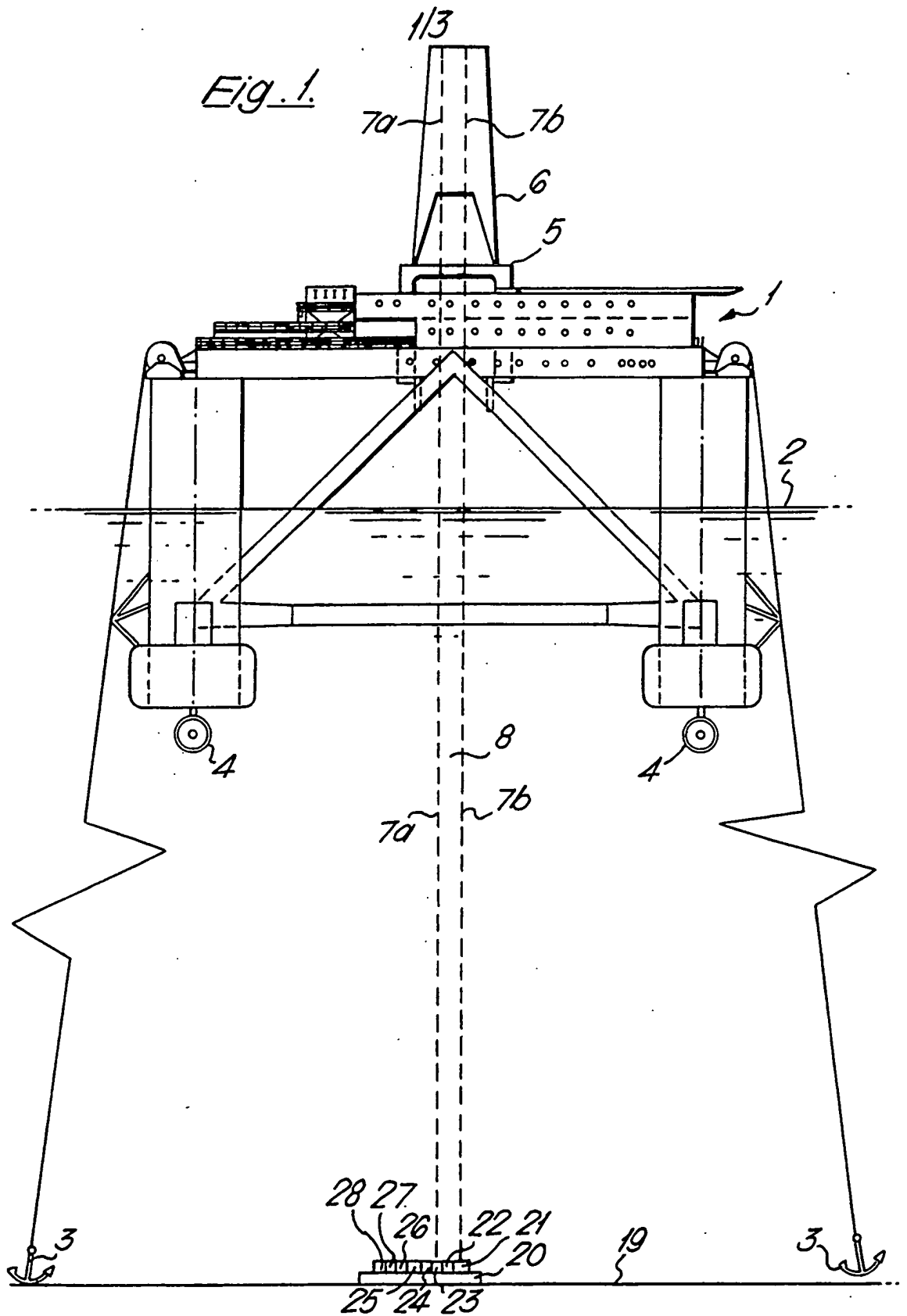
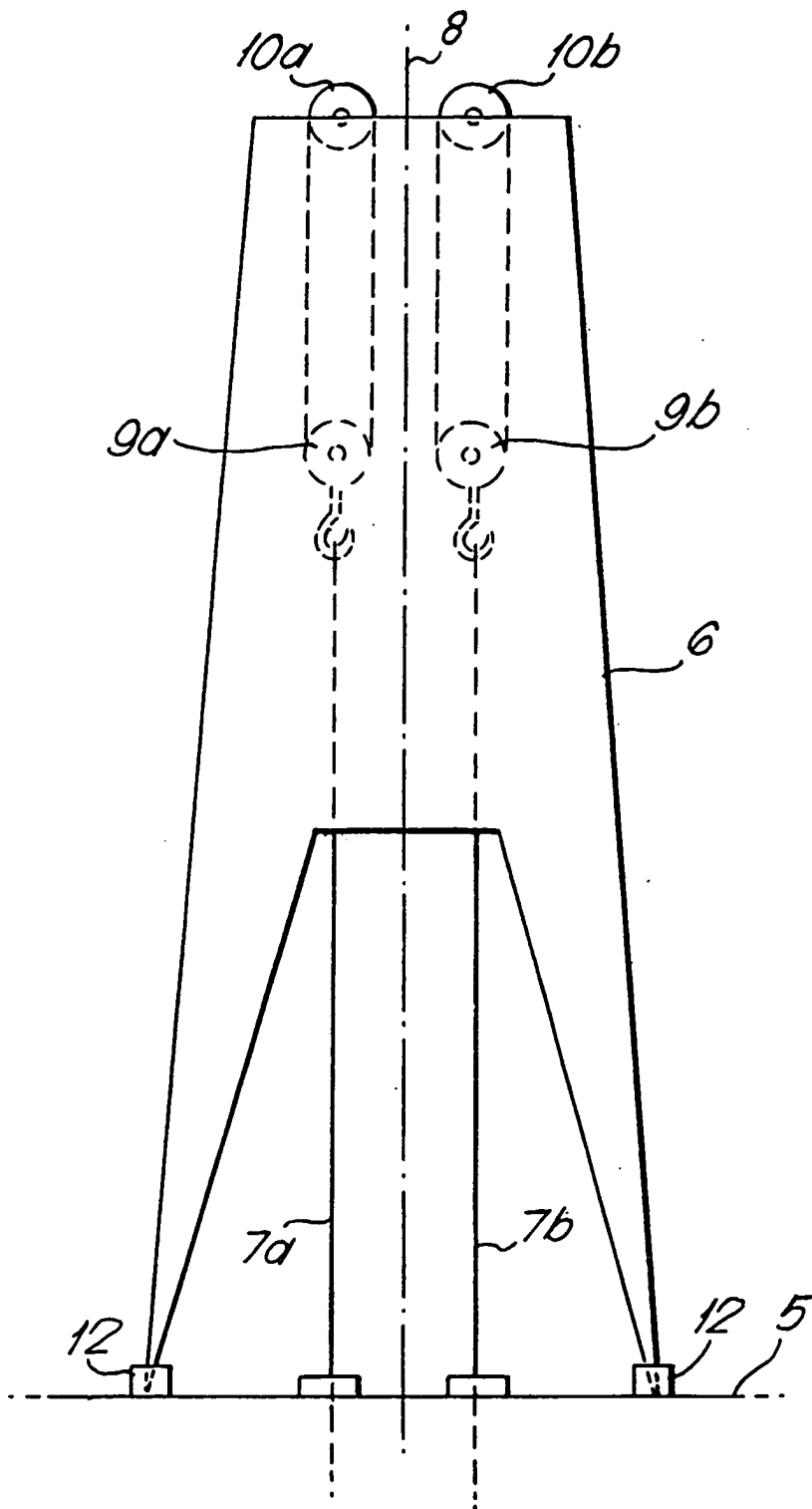
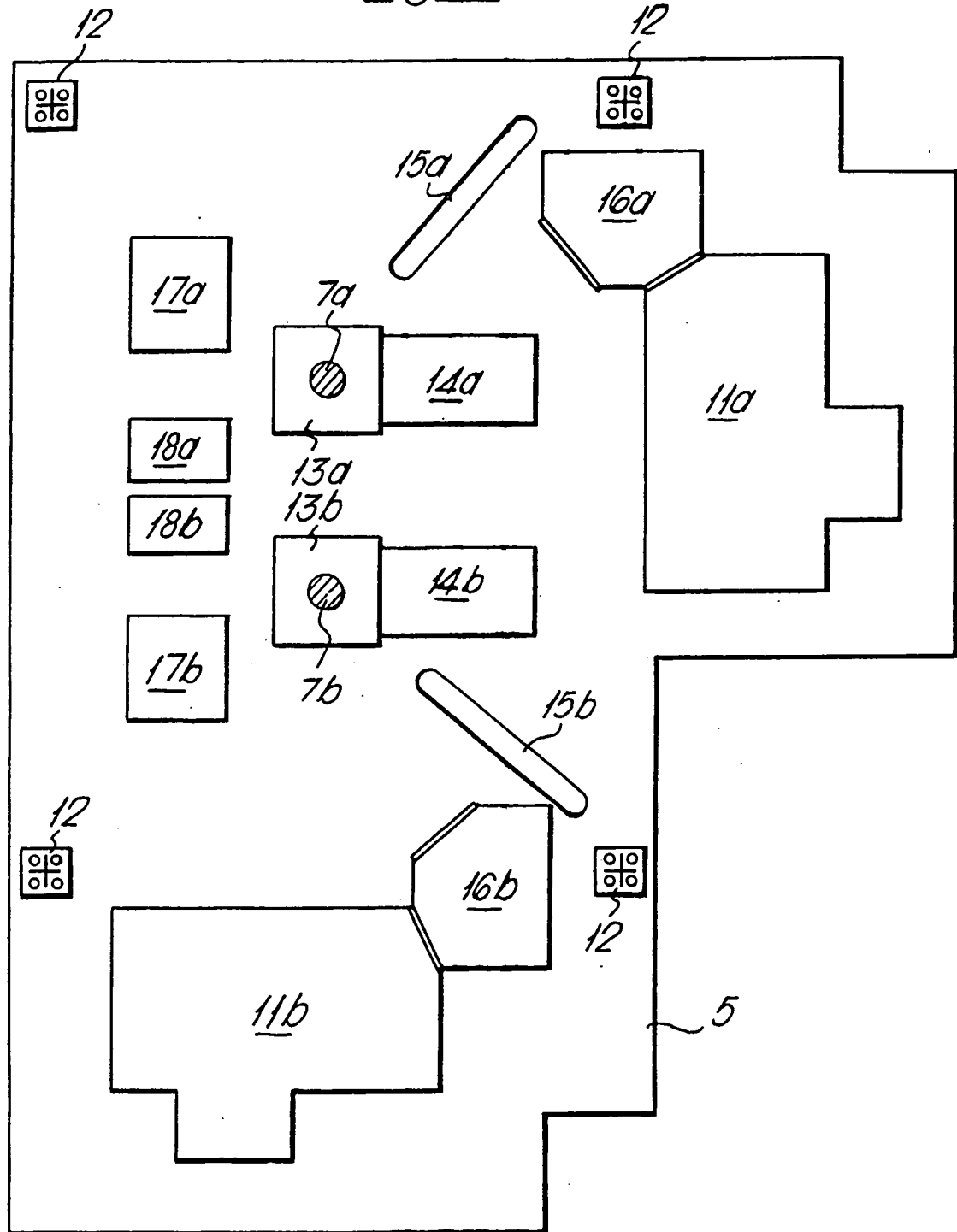


Fig. 2.

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Fig. 3.



SPECIFICATION
Vessel for, and Method of, Drilling
Hydrocarbon Wells

The present invention relates to a vessel for
5 drilling hydrocarbon wells in the sea floor and to a
method of drilling hydrocarbon wells.

Drilling vessels in the form of ships or semi-
submersible platforms for drilling of hydrocarbon
wells in the sea floor in so-called offshore areas
10 are well known. Such vessels have been used for
drilling test wells in exploration for hydrocarbon
deposits. For this purpose the vessels are
anchored and/or held in place by means of
dynamic positioning at the place in question. The
15 vessels are provided with a drilling tower and
appurtenant equipment for a drill string, by means
of which the test wells are drilled one at a time.
When deposits of hydrocarbons have been found
in this way, the extent and production capacity of
20 the deposits are next decided. If the deposit is
found to be exploitable, a more permanent
structure is built and is arranged fixed on the sea
floor at the production site in question. From this
fixed structure a large number of production wells
25 are usually drilled, the completions of which at
the sea floor lie relatively close to each other in
order that the production from the various wells
may more easily be connected to common riser
pipes and for easier control and maintenance of
30 the wells. Since the number of wells below such a
fixed structure may be relatively high, e.g. 20, and
the drilling of each single hole can take several
months, a long time will pass before the
production of the hydrocarbons can start. This
35 entails high cost, inter alia for interest on the
investments in the fixed structure and the wells
already drilled. The delayed income from
production, which for a typical oil field in the
North Sea amounts to several hundred thousand
40 £ sterling per day, will often also be of
considerable importance.

In order to shorten the time from the decision
to put an oil field into production until the
production can start, one has in some cases
45 started drilling of the production wells before
installation of the fixed production structure. The
construction of the production structure, which to
a large extent usually occurs onshore may take
more than a year, and concurrently as many
50 production wells are drilled as time permits
before the production structure arrives and is
placed on the sea floor.

Such advance drilling may be performed by
means of a drilling rig or a drilling vessel of the
55 type used for test drilling and mentioned above. In
pelagic areas having extreme weather conditions
or ice difficulties, such vessels have a relatively
short drilling season. Furthermore, the holes
which are to be drilled will lie close to each other
60 so that it is not possible to use several vessels
concurrently. Therefore, only a very limited
number of production wells can be drilled in
advance, thus necessitating that most of the wells
are drilled following the installation of the

65 production structure.

It is the purpose of the invention to overcome
the above-noted deficiencies, thus making it
possible to advance the production of
hydrocarbons from an offshore field while
70 concurrently reducing the cost of the production
preparations to a considerable degree.

According to one aspect of the present
invention there is provided a vessel for drilling
hydrocarbon wells in the sea floor, the vessel
75 including a drilling tower dimensioned and
constructed to receive at least two drill strings.

Preferably, the vessel includes appurtenant
equipment for each of the drill strings.

The mutual spacing between the drill strings is
80 preferably at least equal to the spacing required to
enable the drill strings to be operated
concurrently.

Preferably, the number of drill strings is two
and preferably the appurtenant equipment for the
85 two drill strings is arranged at a mutual angle of
substantially 90°.

The mutual spacing between the drill strings is
preferably substantially equal to an integral
multiple of the desired spacing between
90 neighbouring wells.

Thus, the drilling vessel may be built as a usual
test drilling rig without appreciable additional cost
due to the relatively small extra size and strength
which is required in the drilling tower. The rig may
95 originally be delivered with only one set of drilling
equipment for customary test drilling. If at a later
time it is desirable to use the drilling rig for
advance drilling of production wells one can
relatively quickly and with simple means install
100 the necessary equipment for further drill strings.
Since the drill strings are placed close to each
other these may be operated concurrently without
the resulting wells lying too far from each other to
be connected to a common riser pipe or to be
105 maintained from the production platform.

Arranging the drill strings in the same tower
has several advantages as compared to arranging
each drill string in a separate tower. Firstly, the
total weight will be less. Secondly, the weight of
110 the drilling equipment may be concentrated near
the middle of the vessel in order not to influence
its stability to any great extent. Thirdly, the
placement of the drilling equipment near the
centre of the vessel will give rise to less relatively
115 motion between the drill strings and the vessel
when the latter heaves and rolls in a heavy sea.
Furthermore, only a single drilling tower will give
rise to less wind forces and better stability also for
this reason. Of other obvious advantages, there is
120 the possibility of concentrating common auxiliary
equipment and permitting better surveying and
coordination. The use of two drill strings in the
same tower makes it possible to place the
appurtenant equipment for the drill strings close
125 to the vertical centre line of the vessel, inter alia
by placing parts of the equipment at a mutual
angle of approximately 90° without reducing the
access to the various parts to any significant
degree. The central arrangement of the

equipment enhances the stability of the vessel.

For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:—

Fig. 1 shows an elevation of a drilling vessel of the semi-submersible type provided with an arrangement according to the present invention;
Fig. 2 shows schematically a part of Fig. 1, but on a larger scale; and

Fig. 3 shows a plan view of the drill floor of the vessel with the drilling tower removed.

There is shown in Fig. 1 a drilling vessel 1 of generally conventional form. The vessel is of the so-called semi-submersible type which in operating position is ballasted to a draft approximately as shown in the figure with respect to the water surface 2. The vessel is held in position by means of anchors 3 and/or equipment for dynamic positioning, as indicated at 4.

Above the other decks of the vessel, a drill floor 5 is arranged, supporting a drilling tower 6 and appurtenant equipment (not shown in Fig. 1) for two drill strings 7a, 7b indicated in broken lines. The drilling tower 6 is preferably arranged coaxially with the centre line 8 of the vessel, one drill string lying on each side of the centre line in order to give the most symmetrical and central loading.

Figs. 2 and 3 show further details of the drill floor 5, the drilling tower 6 and the appurtenant equipment. For each drill string 7a, 7b, a running tackle 9a, 9b and a top block 10a, 10b with hoisting machinery 11a, 11b are arranged in the usual way. The hoisting machineries, as is apparent from Fig. 3, are arranged at 90° with respect to each other so that they may be placed as close to the central axis of the vessel as possible without obstructing the necessary view and access. Other necessary equipment for the drill strings 7a, 7b is arranged between the foundations 12 for the legs of the drilling tower. This equipment comprises rotation tables 13a, 13b and corresponding driving machinery 14a, 14b, so-called rat holes 15a, 15b, the driller's control room 16a, 16b and storage places for drilling pipe etc. 17a, 17b; 18a, 18b. The equipment is placed so that it may be surveyed by the driller during the drilling operation.

When drilling from a floating vessel it is necessary to enclose the drill string in a so-called riser pipe, the lower end of which is attached to a base plate on the sea floor and the upper end of which is movably supported in the vessel. Due to its great length the riser pipe has a certain flexibility and may be deflected with respect to the vertical due to for instance sea currents, waves and the motion of the vessel. When using two drill strings according to the invention it may also be necessary to have two riser pipes, one for each drill string. Due to their lateral motion the riser pipes are generally arranged with a certain mutual spacing, and in many cases this spacing will determine how close together the drill strings

may be arranged and thus also the distance between the wells on the sea floor. However, this spacing will usually not be so large as to cause appreciable problems.

Should one wish a closer well spacing than indicated by the drill string spacing, one may arrange the drill strings so that the distance between the wells thus drilled is large enough to give room for one or more further wells. Fig. 1 illustrates how the invention contemplates a method for obtaining this objective. A base plate 10 or template having guides 21—28 is placed on the sea floor 19. Each guide will later give room for a well head. In the position shown, the drill strings 7a, 7b drill wells through the guides 21 and 23, the guide 22 lying in between. Next, the drilling vessel 1 is moved so that the drill strings drill through the guides 22 and 24. Thereafter the drilling vessel 1 is moved so that wells may be drilled through the guides 25 and 27, and finally wells are drilled through the guides 26 and 28.

The base plate and the drill string distance may of course also be adapted so that two or more well points will lie between two concurrently drilled wells. It will be seen from Fig. 1 that if the distance between the drill strings had been twice as large, one would have first drilled through the guides 21 and 25 in the base plate, thereafter through 22 and 26, followed by 23 and 27, and finally through 24 and 28. In general, the mutual distance between the drill strings must be substantially equal to an integral multiple of the desired distance between two neighbouring wells. Even though the invention has been described above in connection with an exemplifying embodiment showing two drill strings, it will be clear to the skilled person that more drill strings may be arranged, dependent upon the carrying capacity and stability of the vessel. Further drill strings may be arranged in line with the drill strings shown or such that they form a two-dimensional pattern. In any case, the rule given in the preceding paragraph for the mutual distance between the drill strings may be used.

Claims

1. A vessel for drilling hydrocarbon wells in the sea floor, the vessel including a drilling tower dimensional and constructed to receive at least two drill strings.
2. A vessel as claim 1 and including appurtenant equipment for each of the drill strings.
3. A vessel as claimed in claim 1 or 2, wherein the mutual spacing between the drill strings is at least equal to the spacing required to enable the drill strings to be operated concurrently.
4. A vessel as claimed in claim 1, 2 or 3, wherein the number of drill strings is two.
5. A vessel as claimed in claim 4 when appendant to claim 2, wherein the appurtenant equipment for the two drill strings is arranged at a mutual angle of substantially 90°.
6. A vessel as claimed in any preceding claim,

wherein the mutual spacing between the drill strings is substantially equal to an integral multiple of the desired spacing between neighbouring wells.

5 7. A vessel substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

8. A method of drilling hydrocarbon wells on

the sea floor, wherein at least two wells are drilled
10 concurrently, the wells being drilled at a mutual spacing substantially equal to an integral multiple of the desired spacing between neighbouring wells.

9. A method of drilling hydrocarbon wells
15 substantially as hereinbefore described with reference to the accompanying drawings.

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